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Stability Analysis of HEG Shot 1443

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Stability Analysis Parameters



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- 7° Half-angle circular cone
 - 2.5mm-diameter nose radius, 1.0 m long
 - Grid uses 1215 x 350 cells, axi-symmetric
- Run Conditions
 - Velocity = 2507 m/s; Density = 17.5 g/m³
 - Temperature = 293 K; Vibrational Temperature = 293 K*
 - Wall Temperature = 293 K; Mach 7.29
 - Mass Fractions: Based on Shot 1302
 - N₂ = 0.7527; O₂ = 0.2163; NO = 0.0307; O = 0.0003
- 5 species air assumed
 - Blended viscosity model based on Sutherland and Blottner data
 - Eucken relation for heat transfer
 - Reacting; Two-temperature non-equilibrium

*Assumed based on analysis of shot 1302

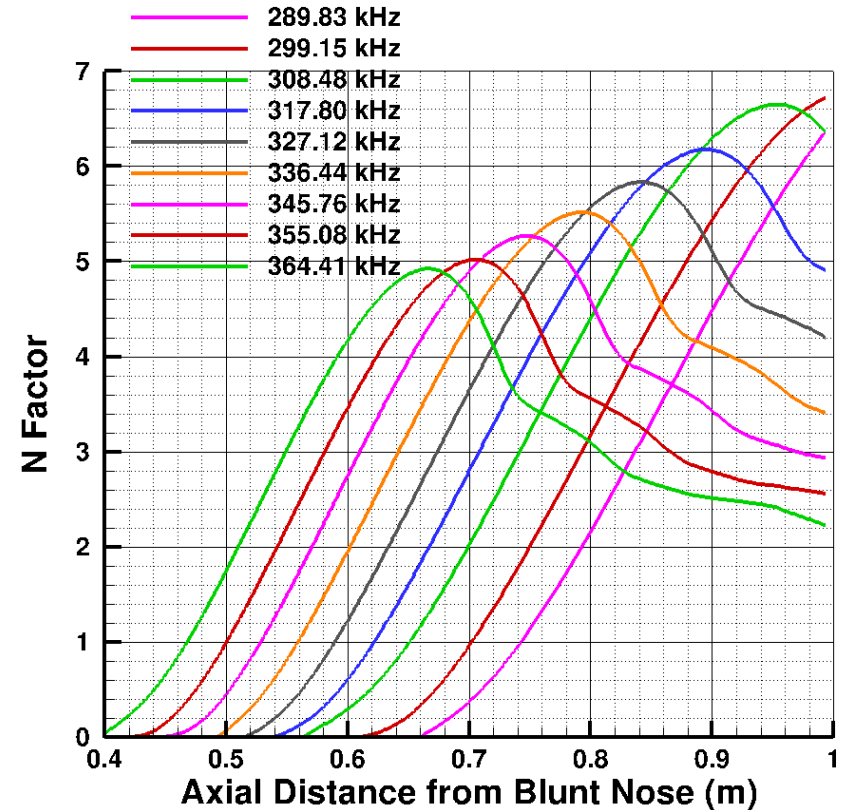
N Factor



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- Frequency Selection
 - Based on N factor around each sensor (0.632 m, 0.767 m, and 0.947 m)
- Transition onset
 - Estimated ~ 0.78 m from the nose (axial distance)



N factor versus axial distance

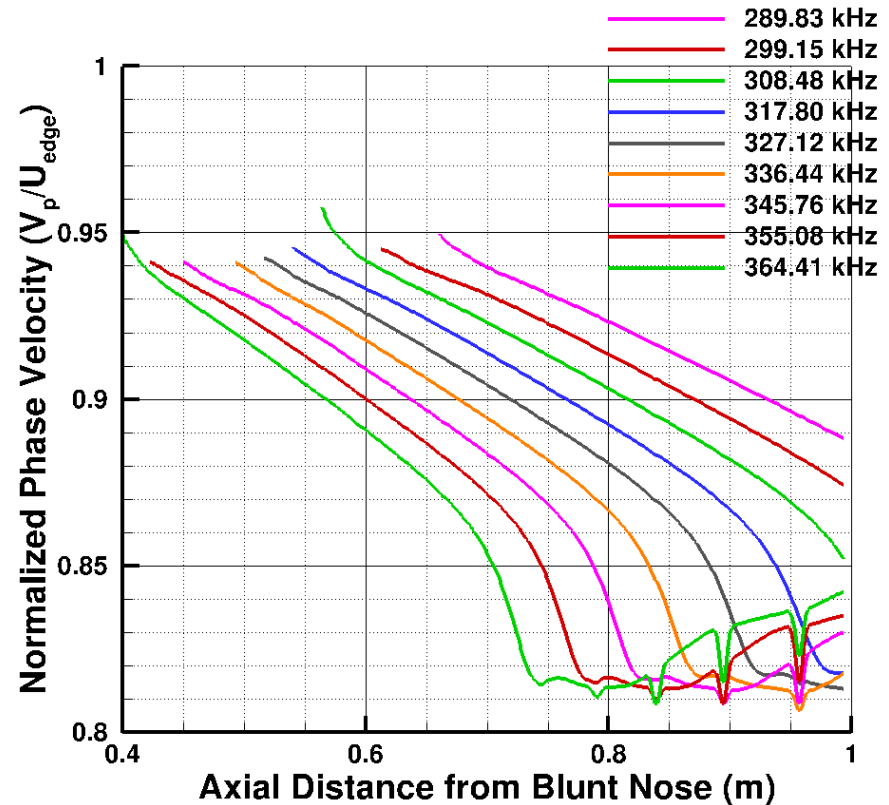
Normalize Phase Velocity



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- Phase Velocity Variation
 - PSE based velocities calculated from STABL output data
 - Edge Velocity ~ 2444 m/s
 - Phase velocity varies between 0.95 and 0.81 across sensors
- Double check of math using STABL internal calculation from LST



Phase Speed for Several Candidate Frequencies

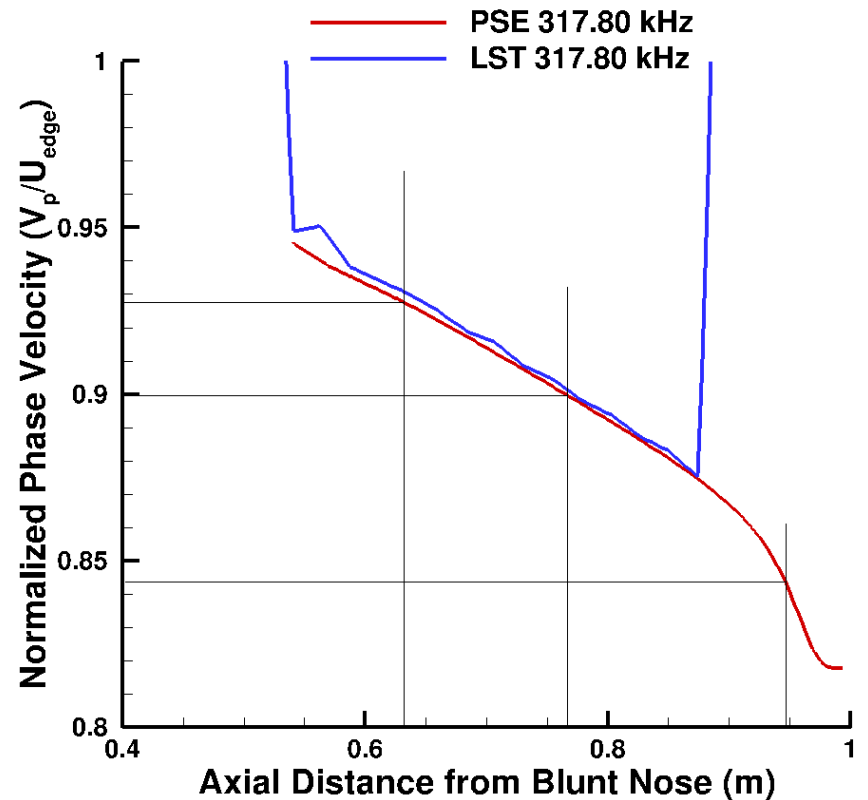
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Phase Speed of Selected Frequency